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AUTHOR	Merrill, Paul F.; Towle, Nelson J.
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ABSTRACT

A study was made of the effects of presenting instructional objectives to students in a graduate computer-managed course. It was expected that the availability of behaviorally stated objectives would reduce test item response latency, increase study time, and reduce state anxiety. Since all subjects were required to reach criterion on each unit of the course, no differences were expected on posttest performance. Results showed no significant difference found in study time or test item response latency. The availability of objectives did significantly reduce the level of anxiety state. Apparently graduate students were able to figure out the course very rapidly, so that the availability of objectives had little or no effect. (JY)

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The Effects of the Availability of Objectives on Performance in a Computer-Managed Graduate Course

Paul F. Merrill and Nelson J. Towle[1,2]
Florida State University

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Curriculum specialists and educational psychologists (Bobbit, 1924; Tyler, 1951; Bloom, 1956; Gagne, 1956) have been advocating the need for precise statements of instructional objectives for many years. The publication of Mager's (1961) classic book on preparing objectives and the increasing stress on the need for accountability of instruction in education have caused the educational community to examine more closely the role of behaviorally-stated objectives in the instructional process. Recently, several investigators have turned to research in an attempt to study the empirical effects of presenting behavioral objectives to the student as part of the instruction. However, many of these studies (Yelon and Schmidt, 1971; Papay, 1971; Merrill, 1970; Merrill & Towle, 1971) utilized either short duration or laboratory type tasks. The purpose of the present study was to investigate the effects of presenting objectives to students in an actual graduate course. Laboratory studies allow precise control of extraneous variables, but if educational research is to have an impact upon instruction, then we must attempt to replicate our laboratory findings in the classroom.

In previous studies using a laboratory task, Merrill (1970) and Merrill and Towle (1971) found that presenting objectives to students reduces test item response latency, increases study time (display latency), and does not affect posttest performance. Based on the results of the previous studies it was hypothesized that the presentation of objectives in

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an individualized graduate course would decrease test item response latency, increase study time, and reduce state anxiety. Since all Ss were required to reach criterion on each unit of the course, no differences were expected on posttest performance. However, it was hypothesized that objectives would facilitate performance on unit tests.

Method

Subjects

The 32 Ss who participated in this study registered for the graduate course, EDR 537, Techniques of Programmed Instruction, during the Spring, 1971 quarter at the Florida State University.

Experimental Task and Measurement Instruments

The learning task consisted of a graduate course, EDR 537, Techniques of Programmed Instruction, offered in the Educational Research Department of the Florida State University. The course was developed according to a systems approach model (Dick, 1969) and used computer-managed instruction to facilitate individualization. Long-term behavioral objectives, cognitive behavioral objectives, and productive behavioral objectives were specified as prescribed by the system approach model. Figure 1 contains sample objectives developed for the course. The development and evaluation of the course is described in detail elsewhere. (Hagerty, 1970).

Insert Figure 1 about here

The first half of the course consisted of twelve cognitive units which covered the concepts and techniques used in programmed instruction. The titles of the respective twelve units were as follows: Systems Approach, Documentation, Problem Identification, Task Analysis, Entry Behavior, Behavioral Objectives, Test Items, Media Selection, Formative and Summative Evaluation, PI versus Non-PI material, Types of PI Frames, and Strategies within PI. Each cognitive unit had one long-term behavioral objective and from 1-3 cognitive behavioral objectives. The second half of the course consisted of eleven productive units which required the student to develop, evaluate, and document a programmed text which covered approximately one hour of instruction. The Ss were provided a course manual which included an introduction to the course, instruction concerning the course procedures, a study time recording sheet, and a list of primary and secondary references for each unit. Half of the course manuals contained long-term and cognitive objectives for units 1-6 while the other half of the manuals contained long-term and cognitive objectives for units 7-12. All manuals contained productive behavioral objectives for the final eleven units. Several copies of each reference cited in the course manual were available on reserve at the University and Computer-Assisted Instruction Center libraries. Multiple-choice test items were developed for each unit, and the items were criterion referenced to the corresponding unit cognitive objectives. The unit test items were presented under computer control on the cathode ray tube (CRT) terminals of the IBM 1800/1500 Computer-Assisted Instruction system.

The pretest consisted of a paper and pencil booklet containing 16 short-answer constructed response test items referenced to the long-term

behavioral objectives. An additional 16 irrelevant dummy items were interspersed among the criterion-referenced items in order to minimize the orienting effects of the pretest. A paper and pencil posttest was constructed which contained 16 constructed-response items referenced to the long-term behavioral objectives. The review test consisted of 50 multiple-choice test items selected from the unit tests and was presented on the CRT terminals.

The A-Trait and A-State scales of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) were administered to all Ss during the first class session. A short form (O'Neil, 1970) of the A-State scale was given after each unit test.

Procedure

During the first class session the Ss were given a short lecture which described the course procedure and the purpose of the experiment. After administration of the anxiety scales and the pretest the Ss were randomly assigned to two groups. Group 1 received the course manuals which contained long-term and cognitive behavioral objectives for units 7-12 while Group 2 received the course manuals which contained objectives for units 1-6. Thus, for the first six units, Group 2 was the experimental or objective group and Group 1 was the control or not objective group. The treatments were reversed after the first six units to avoid penalizing a particular group. All Ss who participated pledged not to share objectives with Ss in the opposite group. An anonymous questionnaire given at the end of the course revealed that one S from each group looked at the objectives given to the opposite group.

After studying the references prescribed in the course manual for a given unit, each student signed on to a computer terminal and entered his study time on the unit, which references he studied, and any comments concerning the unit. While at the terminal, each S also responded to 10 criterion test items per objective for that unit and to the short form A-State scale. If the S answered correctly at least 80% of the criterion items on each objective, he was instructed to proceed to the next unit. Otherwise, he was instructed to review the references and take another test on the same unit. At the end of the twelfth unit, all Ss were given the 50-item review tests and the paper and pencil posttest. The productive units of the course were not included as part of this study since it would have been impossible to give the student instructions on the productive units which would not have given away the objectives for those units.

Results

The following data were obtained during this study: Pretest scores, posttest scores, review test scores, unit test scores, unit study time, test item response latency by unit, pre-task and unit A-State scale scores, and pre-task A-Trait scores. Since the treatments were reversed after the first six units, the data obtained for the units 1-6 were of primary interest in this study.

The means and standard deviations for Groups 1 and 2 on the pretest, the units 1-6 scale of the review test, and the posttest may be found in Table 1. The review test and posttest means were analyzed using the t test. As expected, no significant differences were obtained. Similar results were obtained by analysis of covariance with pretest scores as the covariate and the posttest and the units 1-6 scale of the review test as criteria.

Insert Table 1 about here

The group means and standard deviations on average study time for the first six units and the average test item response latency for the first six units are presented in Table 2. These means were analyzed using the t test. No significant differences were obtained.

Insert Table 2 about here

Unit test score means and standard deviations for each of the first six units and the total unit test scores over the first six units are presented in Table 3. These means were also analyzed using the t test and no significant differences were found between groups.

Insert Table 3 about here

The results from an analysis of covariance with A-Trait and pre-A-State as the covariates revealed a significant difference, $F(1, 28) = 5.66$, $p < .05$, wherein the availability of objectives decreased the level of A-State. The adjusted means for Groups 1 and 2 on average A-State scale scores for the first six units were 11.8 and 9.9 respectively. A similar post hoc evaluation of the differences between A-State means by unit revealed that A-State was only significantly reduced for the first three units ($F(1,28) = 5.39$, $p < .05$; $F(1,28) = 4.88$, $p < .05$; $F(1,28) = 6.707$, $p < .05$). The adjusted A-State means for the first six units and the average A-State means over the first six units are found in Table 4.

Insert Table 4 about here

Discussion

The purpose of this study was to investigate the effects of presenting objectives to students in a graduate computer-managed course. The effects of objectives on study time and test item response latency found using laboratory tasks were not supported by the results of this study. These effects seem to "wash out" in an actual graduate course. The only significant effects were in the affective domain. The availability of objectives significantly reduced the level of A-State. However, even that effect diminished as the course progressed.

Even though the use of objectives in instruction has considerable intuitive appeal, the results of this study seem to indicate that their use in graduate instruction may be overrated. Apparently sophisticated graduate students in this course were able to "psych out" the course very rapidly and the availability of objectives had little effect. Further research is needed to determine whether or not the results found in this study can be generalized to non-graduate level and non-individualized courses.

This study did not address itself to the value and effects of specifying and using objectives in the design and development of instruction. It may be that the use of behavioral objectives and the systems approach in the instructonal design process may reduce the need for presenting objectives to the student. However, if objectives are specified to facilitate course development, then there is little additional cost involved in utilizing the previously developed objectives as part of the course material. However, the results of this study indicate that the development of objectives solely for the purpose of giving them to the students may not be cost effective.

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FOOTNOTES

1. This research was supported by the Office of Naval Research under contract No. N00014-68-A-0494.

2. Paper presented at the annual meeting of the American Educational Research Association, Chicago, April, 1972.

TABLE 1

Group Means and Standard Deviations
for Pretest, Unit 1-6 scale of Review Test, and Posttest

GROUP	Pretest		Unit 1-6 Review Test		Posttest	
	Mean	SD	Mean	SD	Mean	SD
No-Objective (1)	7.87	10.47	17.75	2.19	91.44	5.25
Objective (2)	11.87	8.88	19.06	2.16	91.62	5.07

TABLE 2

Group Means and Standard Deviations

for Study Time and Test Item Response Latency

Group	Study Time[a]		Test Item Response Latency[b]	
	Mean	SD	Mean	SD
No Objective (1)	121.11	94.19	259.62	88.46
Objective (2)	117.28	115.86	271.37	137.91

[a]In minutes

[b]In seconds

TABLE 3

Group Means and Standard Deviations for

Unit Tests 1-6 and Total Unit Test [a]

Group	Unit													
	1		2		3		4		5		6		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No Objective (1)	17.25	1.77	7.81	.65	8.81	1.22	11.31	2.41	7.81	1.17	16.19	3.45	69.19	5.81
Objective (2)	17.56	1.67	7.87	1.86	9.25	1.00	11.25	1.57	7.69	1.08	17.87	1.71	71.50	5.60

[a]The unit tests contained 10 to 30 items depending on the number of objectives for a given unit.

TABLE 4

Adjusted Means for A-State Scores

for Units 1-6 and Average over Units 1-6 with

A-Trait and pre-A-State Scores as Covariates

Group	Unit						
	1	2	3	4	5	6	Average
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
No Objective (1)	12.90	12.20	10.64	12.04	11.37	11.59	11.81
Objective (2)	10.16	9.61	8.36	11.33	10.81	9.78	9.86

Longterm behavioral objective[a]

The student will be able to describe differences between norm referenced and criterion-referenced tests, and describe the relationship which should exist between behavioral objectives and test items written for the same instructional sequence.

Cognitive behavioral objectives[a]

(1) Given descriptions and examples of several measures, or the reasons for making these measures the student will be able to distinguish those which are used as criterion-referenced measures from those which are used as norm-referenced measures.

(2) Given a specific behavioral objective, the student will be able to discriminate between items which measure attainment of that objective and those which do not.

Productive behavioral objective[a]

The student will write test items based on the behavioral objectives he wrote and organize them into a pre- and posttest for an evaluation of the criterion specified by the terminal objectives for his program.

Figure 1.-- Sample Behavioral Objectives from the Course

[a]The criterion level of 80% correct and the conditions under which the behaviors would be measured were specified in the introductory section of the course manual to prevent excessive repetition.